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The Role of Credit Ratings on Capital Structure and Its Speed of Adjustment: An International Study

Abstract

Using an international dataset, we examine the role of issuers' credit ratings in explaining corporate leverage and the speed with which firms adjust toward their optimal level of leverage. We find that, in countries with a more market-oriented financial system, the impact of credit ratings on firms' capital structure is more significant and that firms with a poorer credit rating adjust more rapidly. Furthermore, our results show some striking differences in the speed of adjusting capital structure between firms rated as speculative- and investment-grade, with the former adjusting much more rapidly. As hypothesized, those differences are statistically significant only for firms based in a more market-oriented economy.

JEL Classifications: G32; G24; G15
Keywords: Capital structure, credit ratings, speed of adjustment

The Role of Credit Ratings on Capital Structure and Its Speed of Adjustment:

An International Study

1. INTRODUCTION

Until a decade ago, the effect of credit ratings on firms' capital structure was generally neglected in empirical research. This status quo changed in 2006, after Kisgen articulated his "credit rating–capital structure hypothesis" in a seminal paper. Since then, studies on the relationship between credit ratings and firms' leverage policies in the US market have mushroomed (Byoun, 2011; Faulkender, Flannery, Hankins, and Smith, 2012; Frank and Goyal, 2009; Kisgen, 2009; Mittoo and Zhang, 2010; Tang, 2009). Although the importance of credit ratings on firms' capital structure has been amply documented, the rapidly growing literature on differences in corporate capital structure across countries continues to neglect credit ratings from the list of determinants (Antoniou, Guney, and Paudyal, 2008; Fan, Titman, and Twite, 2012; González and González, 2008).[1] To the best of our knowledge, only one study (Huang and Shen, 2015) investigates the effect of changes in credit ratings on firms' capital structure and the speed with which they adjust to an optimal level of leverage in an international context. We try to fill this gap by examining the role of credit ratings, especially the rating level, on both firms' capital structure and the speed with which they adjust to an optimal level of leverage in the international context, spanning two decades from 1991 to 2010. We pose three main questions: (1) What is the effect of credit rating levels on firms' leverage? (2) What is the effect of credit rating levels on the speed with which firms adjust their capital structure to an optimal level? (3) Do the effects from (1) and (2) depend on the financial orientation of a country (bank based vs. market based) in which rated firms are based?

[1] This seems surprising, given the documented importance of credit ratings on financing decisions (at least in the United States) and the global presence of credit rating agencies and their services (Djankov, McLiesh, and Shleifer, 2007).

Unlike previous studies (e.g., Kisgen, 2006), this study explores the role of credit rating levels, rather than rating changes or having a credit rating, on capital structure decisions. Many surveys (Bancel and Mittoo, 2004; Brounen, de Jong, and Koedijk, 2004; Graham and Harvey, 2001; Servaes and Tufano, 2006) explore managers' concern over the company's credit rating level.[2] Papers that include credit ratings among the determinants of capital structure conducted with respect to the United States offer mixed results. For example, Tang (2009) argues that the higher the credit ratings, the higher the firm's leverage ratio while evidence for a negative relation is found in studies by Bougheas, Mizen, and Yalcin (2006), Byoun (2011), Frank and Goyal (2009), Leary and Roberts (2005), and Mittoo and Zhang (2010), among others.[3] Our study adds evidence to the debate in an international context.

Although the literature on dynamic capital structure is rapidly growing, only three studies (Faulkender et al., 2012; Huang and Shen, 2015; Kisgen, 2009) directly examine the influence of credit ratings on the speed with which firms rebalance their debt ratios to achieve target levels. Kisgen (2009) focuses on credit rating changes and finds that rating downgrades make firms adjust more rapidly. However, when ratings are upgraded, he finds no significant change in companies' speed of adjustment. Faulkender et al. (2012) compare the speed of adjustment of rated and nonrated companies and argue that having a credit rating can "affect leverage adjustment speeds so greatly that they can reverse the usual finding … that under-levered firms adjust less rapidly than over-levered firms" (p. 643). We add to these studies by

[2] Graham and Harvey (2001), in a survey conducted on US firms' chief financial officers (CFOs), document that the credit rating level is the second-most-important factor (nearly on par with financial flexibility) in financing decisions. According to their survey, over 57% of managers consider their company's level of credit rating very important. Bancel and Mittoo (2004) find even stronger evidence for the importance of credit rating levels from a survey of European firm managers, in which firms' credit rating levels are seen as very important by CFOs. Brounen, de Jong, and Koedijk (2004), in their survey of European CFOs, find that between 27% and 39% of CFOs "always or almost always … choose the appropriate amount of debt" based on their current credit rating (p. 95). More recently, Servaes and Tufano (2006), in their worldwide survey of 334 companies, document that the largest percentage (60%) of "Firms do not add more debt because they have reached their target and because this would lead to a drop in credit ratings" (p. 45). In addition, they find that credit ratings "independent of any other factors" are the most important factors in determining firms' level of debt. They conclude that such results "indicate that companies care about the rating, per se. Further work is required by finance theorists to investigate why this might be the case" (p. 42).

[3] For a brief discussion of each of those studies, see Section 2.3.

focusing on credit rating levels and their impact on the speed of adjustment of companies operating in 19 countries. In addition, we examine the difference between speculative- and investment-graded firms' capital structure adjustment and further validate Kisgen's (2009) findings in an international context.

Prior research on international capital structure investigates the relation between financial orientation and capital structure; however, the empirical studies have mixed findings. For example, Antoniou et al. (2008) and Borio (1990) report that German companies (in a bank-based economy) are more highly leveraged than Canadian firms (in a market-based economy) while Rajan and Zingales (1995) find evidence of the opposite. In addition, the existing literature sheds no light on the relationship between credit ratings and capital structure and the impact of financial orientation on that relationship. We extend the literature by examining the impact of credit ratings on firms' leverage in 19 countries with different financial orientations.

One potential problem in the studies exploring the effect of the credit rating level on capital structure is the simultaneity (or dynamic nature) between credit ratings and corporate leverage. When credit rating agencies assess firms' creditworthiness, they examine the firm's current and past levels of debt. Because the credit rating can be seen as a proxy for the probability of default, the higher the company's leverage, the higher that probability and the possibility of a lower credit rating. By contrast, if a firm has a higher credit rating, the firm's cost of debt financing is lower, and thus the managers can borrow at a lower cost and increase their leverage in the future. We successfully mitigate this critical issue by selecting and employing two-step system generalized method of moments (GMM) dynamic modeling, which was found to be the most suitable in previous literature investigating firms' dynamic capital structure decisions (e.g., Antoniou et al., 2008).[4]

[4] The system GMM procedure developed by Arellano and Bover (1995) and Blundell and Bond (1998) can deal with the simultaneity, unobserved heterogeneity, short panel bias, and a number of other problems that arise

Using 17,102 firm-year observations from 19 economies[5] between 1991 and 2010, this paper investigates the impact of the credit rating level on capital structure and the speed of that capital structure's adjustment. The findings can be summarized as follows. First, credit ratings are negatively associated with leverage ratios. Firms with a good credit rating may be more conservative in their use of debt financing and can issue stock more easily than firms with a poor credit rating. Second, we find that firms with a lower credit rating have significantly more rapid adjustment in their capital structure than firms with a better credit rating; and the effect of credit rating on the speed of adjustment is greater in more market-oriented financial systems. Third, the effect of credit rating levels varies substantially—that is, the more market oriented the country in which the company is based, the stronger the effect stemming from the credit rating, ceteris paribus.

This paper makes contributions to the existing literature by investigating the role of credit ratings in capital structure and the adjustment speed of capital structure in different countries. To the best of our knowledge, this paper is the first to show that poorly rated firms have more rapid adjustment in their capital structure than highly rated firms. Two papers in the literature are similar to our study. The paper by Kisgen (2006) motivates this study on exploring the role of credit rating in capital structure. Our paper differs from Kisgen (2006) in that we focus on credit rating levels rather than ratings near a change. As shown above, in practice, managers care about credit rating levels; thus it is meaningful to directly test the impact of credit ratings on leverage ratios.

Another paper, by Huang and Shen (2015), also explores the influence of rating changes on corporate leverage adjustment in an international context. Our estimates differ from Huang and Shen's (2015) along a number of important dimensions. First, their paper concerns the

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when the difference GMM technique is applied (see Section 3.4).

[5] The economies include Australia, Canada, France, Germany, Hong Kong, India, Indonesia, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, Switzerland, Thailand, the U.K., and the United States.

effect of rating changes (i.e., downgrades and upgrades) on changes in corporate leverage (adjustment speed); our paper tests the impact of credit rating levels on both the level and the adjustment speed of corporate leverage. Additionally, we explore the impact of financial architecture in different countries on the relationship between credit ratings and corporate leverage, which is not explored in Huang and Shen (2015). Second, Huang and Shen (2015) use the pooled ordinary least squares (OLS) method whereas this paper employs GMM dynamic regressions which can address the endogeneity problem between credit rating and corporate leverage.[6]

The rest of this paper is structured as follows. The next section briefly reviews the related literature. We then develop hypotheses, introduce econometric models, and describe the variables and data used. The results are then presented, and their implications for capital structure are described in detail. The last section concludes the paper.

2. LITERATURE REVIEW

2.1. Theories of Capital Structure

We can distinguish among three major strands of studies on capital structure: the trade-off theory, the pecking-order theory, and the market-timing theory. The trade-off theory (Kraus and Litzenberger, 1973) states that a firm's capital structure is chosen based on the idea of achieving an optimal level of leverage. The value-maximizing debt ratio is achieved by balancing the costs and benefits of debt financing. On the one hand, leverage can reduce corporate taxes. On the other hand, increased leverage incurs the costs of financial distress, both direct and indirect (Modigliani and Miller, 1963), and various agency costs (e.g., Jensen, 1986). Using a sample of Dutch, nonfinancial firms listed on the Amsterdam Stock Exchange, de Jong and Van Dijk (2007) find that the trade-off between tax advantage and bankruptcy costs determines leverage. According to the pecking-order theory developed by Myers (1984)

[6] OLS assumes that all the independent variables are strictly exogenous.

and Myers and Majluf (1984), companies do not aim to achieve a specific debt-equity ratio. Rather, because of asymmetric information between managers and investors, firms have a preference for internal financing over debt and for debt over equity when raising funds for investment. The market-timing theory also eschews the idea of an optimal capital structure. Instead, management is more apt to issue equity when stock prices are high and to repurchase equity when stock prices are low (Baker and Wurgler, 2002). Thus, firms try to minimize the cost of financing by timing the market.

Fischer, Heinkel, and Zechner (1989) attempt to reconcile the trade-off theory and the pecking-order theory using dynamic modeling, in which firms follow the pecking-order theory in the short run and the trade-off theory in the long run. Whenever the adjustment costs of rebalancing to achieve the optimal level of leverage outweigh the costs of being outside this optimum, managers will allow their firm's leverage to diverge temporarily from it and make adjustments only occasionally. Using partial-adjustment models, Huang and Ritter (2009), Leary and Roberts (2005), and Lemmon, Roberts, and Zender (2008) document that firms rebalance their debt ratio at various speeds of adjustment.

Recently, a number of researchers conducted an international comparison of the speed of adjustment and document that the speed with which firms converge toward their target leverage level varies substantially across countries (e.g., Antoniou et al., 2008; González and González, 2008; Wanzenried, 2006). Öztekin and Flannery (2012) argue that an economy's legal and financial institutions significantly influence the speed of adjustment based on distinct costs or benefits associated with the adjustment process. Furthermore, they document that, on average, firms located in market-based countries display much more rapid adjustment than those in bank-based countries (annually by 19% and 3%, respectively). They argue that their results "suggest that a market-based structure imposes lower costs of adjusting or higher benefits of converging to a firm's optimal capital ratio, or both" (p. 103).

2.2. Countries' Financial Orientations

Conventional thinking holds that, in bank-based financial systems, banks provide most of the capital for firms while, in market-based systems, firms raise funds on capital markets (Schmukler and Vesperoni, 2000). Bank-based countries are characterized by having banking systems that are relatively more developed than their stock market. The opposite is the case in market-based economies, in which stock markets are larger and more liquid in comparison to the bank-based countries (Demirgüç-Kunt and Maksimovic, 2002).

Because of the diverse research findings and the rapid development of stock markets[7] in many of the traditionally bank-based countries over the past three decades (Rajan and Zingales, 2003), many scholars claim that the traditional differentiation between economies as being bank based or market based is inaccurate or inappropriate (e.g., Kwok and Tadesse, 2006; Purda, 2008; Tadesse, 2006). Rajan and Zingales (2003) report that in the last two decades of the twentieth century, stock markets in many countries regarded as bank based expanded by more than 13-fold in terms of market capitalization, and equity financing grew more than 16-fold. During the same period, the corresponding growth in the U.S. and the U.K. (market-based countries) market capitalization was approximately fourfold. Thus the traditional breakdown of countries into bank based and market based might be too simplistic in today's world.

In light of this, we adopt an alternative way of capturing the orientation of a country's financial system by using the financial architecture (*FINARCH*) variable developed and used by Kwok and Tadesse (2006), Levine (2002), and Tadesse (2006). In a nutshell, the variable *FINARCH* is an index of the degree of stock market orientation in a country arrived at by comparing the size, activity, and efficiency of a stock market to those of a banking system in an economy. A more market-oriented financial system (represented by higher values of the

[7] See also Ramos (2009) for an analysis of the development of 101 stock markets from 1975 to 2013.

variable *FINARCH*) should make equity financing cheaper and more readily available for companies.

2.3. Capital Structure and Credit Ratings

Credit rating agencies provide information about financial instruments and their issuers in the form of credit ratings corresponding to the assessed creditworthiness of the issuing body. Consequently, credit ratings can be seen as a proxy for the probability of a firm's default and enable investors to value the financial instruments and set the required yield on them according to their default risk.

Graham and Harvey (2001), through a survey carried out on CFOs at US firms, document that a credit rating level is the second-most-important factor (nearly on par with the most important factor, financial flexibility) in financing decisions. Bancel and Mittoo (2004), in their survey of managers at European companies, find that credit ratings have an even stronger effect on financing decisions. Servaes and Tufano (2006), in their international survey on 334 firms, establish that, from the perspective of CFOs, preserving the current credit rating level is the most important (out of 20 factors) in determining a company's level of debt. Leary and Roberts (2005) divide their sample into two portfolios: companies with above and below speculative-grade credit ratings. Their results show a negative association between investment-grade credit ratings and debt issuance. Using a U.K. sample of 16,000 manufacturing firms, Bougheas et al. (2006) find a negative relation between credit ratings and both short-term and total debt levels.

Kisgen (2006) argues that companies expecting changes in their credit rating tend to issue equity, instead of bonds, in order to avoid the extra cost of a rating downgrade or to capitalize on an upgrade later. In addition, he claims that different credit ratings carry discrete costs and benefits that can outweigh the costs and benefits of debt financing proposed by the trade-off theory. Kisgen (2009) documents that downgraded firms reduce their leverage and adjust

significantly more rapidly to achieve their target level of leverage. Frank and Goyal (2009) observe a significant negative impact on the ratio of total debt to market assets if a firm has debt with an investment-grade rating. Tang (2009) shows that firms with an upgraded credit rating gain better access to the credit market. Hence, they react by increasing debt financing relative to equity financing. Mittoo and Zhang (2010) argue that, through simply having credit ratings, firms gain access to the bond market. They assert that highly rated firms care about their credit rating more than low-rated firms. This explains why, despite having access to bond markets, firms with a good credit rating issue substantially less debt than their poorly rated counterparts. Byoun (2011) argues that credit ratings and leverage ratios have a negative relationship because of the different demands for financial flexibility.

Faulkender et al. (2012) use bond ratings to distinguish between financially constrained (without bond credit ratings) and unconstrained companies (with bond credit ratings). They find that overlevered companies with credit ratings adjust substantially more slowly to a target level than nonrated firms, whereas rated firms that are underlevered adjust substantially more quickly than their nonrated counterparts. They argue that, on the one hand, overlevered firms with credit ratings are less concerned about excessive debt because they can access financial markets more easily. On the other hand, rated firms that are underlevered benefit more from increasing their leverage to achieve their target level. Baghai, Servaes, and Tamayo (2014) find evidence that credit rating agencies became more conservative when assigning bond ratings over time (1985-2009). Stricter ratings make US firms more likely to reduce their leverage, less likely to ask for a debt rating, and less likely to hold large amounts of cash. Using a cross-country sample, Huang and Shen (2015) argue that downgraded and upgraded firms react by adjusting their capital structure in a way documented by Kisgen (2009). In addition, they find evidence that firms adjust their leverage more quickly "in countries with better financial development and strong legal and institutional environments than in weak

ones, regardless of the upgraded and downgraded rating changes" (p. 277).

A large body of literature investigates two kinds of debt heterogeneity in capital structure that occurs at firms with different credit ratings. In his seminal papers, Diamond (1991a, 1993) proposes a non-monotonic relation between firms' credit quality and debt maturity. In his model, firms with the highest and lowest credit ratings use mainly short-term debt, whereas "middle-rated" firms use mainly long-term debt. Diamond's model was later supported by empirical evidence in Barclay and Smith (1995) and Bougheas et al. (2006).[8]

Another source of heterogeneity determined by firms' credit ratings relates to the source of debt. Diamond (1991b) asserts that highly rated companies tend to issue directly placed debt (e.g., commercial paper), whereas medium-rated companies tend to borrow from banks. His findings were confirmed by Stohs and Mauer (1996), who investigate the distribution of various types of debt contract across firms with different credit ratings. Denis and Mihov (2003) document that firms with the highest, medium, and the lowest credit ratings borrow mainly from public sources, banks, and nonbank private lenders, respectively. For example, they estimate that firms with an investment-grade credit rating are 60% more likely to issue public debt than firms with non–investment-grade ratings. They assert that this causal relation stems from different levels of information asymmetry and borrowers' reputation conveyed to markets by credit ratings. In their recent study, Rauh and Sufi (2010) argue that highly rated firms rely on senior unsecured debt and equity; however, poorly rated firms rely on secured bank loans and subordinated debt.

3. METHODOLOGY

3.1. Hypotheses development

We propose three hypotheses related to the impact of credit rating levels on capital

[8] Another association between credit ratings and heterogeneity in the maturity structure of firm debt can be derived from managerial optimism (Graham, Harvey, and Puri, 2013; Landier and Thesmar, 2009). Jung and Subramanian (2013) find strong empirical evidence and argue that "long-term debt declines with optimism, whereas short-term borrowing increases" (p. 1617). It is easy to argue that a credit rating upgrade is a purely positive event from a manager's perspective.

structure and its adjustment speed. According to Tang (2009), higher credit ratings provide firms with lower borrowing costs and better access to debt markets, and therefore their leverage ratios should go up. This is, however, inconsistent with the evidence of de Jong, Verbeek, and Verwijmeren (2012) that, in order to preserve their investment-grade credit ratings and financial flexibility, firms remain underlevered to preserve their debt capacity for difficult periods.

Existing studies document that a credit rating reduces the problem of information asymmetry. Frank and Goyal (2009) and Liu and Malatesta (2005) argue that, by signaling firms' higher value, better credit ratings lower information asymmetry between firms' managers and investors, which, in turn, decreases the cost of equity financing. Gomes and Phillips (2012) document that the greater the asymmetric information, the lower the probability of issuing equity and the higher the probability of issuing debt. Rauh and Sufi (2010) document that the better the firms' credit rating, the more firms rely on an equity form of capital; poorly rated firms use more secured loans and subordinated debt. Additionally, companies with better ratings use excess cash to pay back existing debt rather than repurchase equity (Myers, 1984), which leads to a lower debt-equity ratio. To sum up, highly rated firms become conservative in the use of debt financing, and firms tend to use equity, rather than debt, if they have a better credit rating. This leads us to our first hypothesis.

Hypothesis 1: *A better credit rating has a negative effect on a firm's leverage ratio.*

The existing literature shows that a firm's speed of adjustment to achieve its target level of leverage depends on the costs and benefits[9] of such an adjustment (e.g., Öztekin and Flannery, 2012). Kisgen (2006) claims that credit ratings per se impose discrete costs and benefits that can dominate the costs and benefits of debt financing proposed by the trade-off

[9] One example of adjustment costs is transaction costs from issuing/repurchasing debt and equity incurred by a firm when it converges to its desired leverage ratio. Adjustment costs can impede the realization of target capital structure and cause a company to diverge from its optimal leverage periodically (e.g., Flannery and Rangan, 2006).

theory. This, in turn, explains why high-quality companies are underlevered from the perspective of both the trade-off theory and the pecking-order theory and poor-quality firms tend to be overlevered. Korajczyk and Levy (2003) document that financially unconstrained, highly rated firms are more likely to deviate from their target leverage ratios in an attempt to time the markets by issuing/repurchasing securities when macroeconomic conditions are most favorable. Similarly, de Jong et al. (2012) find that firms with an investment-grade credit rating remain underlevered and issue debt when the time is right or when necessary (i.e., during constrained times).

The adjustment speed also differs in highly rated (or underlevered) and poorly rated (or overlevered) firms. Kisgen (2009) argues that downgraded, overlevered firms strive to diminish their leverage and effectively converge at their target levels significantly more rapidly. Faulkender et al. (2012) and Hovakimian (2004) find evidence that, in general, overleveraged firms display significantly more rapid adjustment than their underlevered peers. Faulkender et al. (2012) persuasively argue that "Under-levered firms forego tax benefits of leverage and have little concern with financial distress costs. Yet potential financial distress costs loom quite large for over-levered firms" (p. 636). Korteweg (2010)'s results show that, as firms drift below their optimal leverage ratio, their value goes down much more slowly than is the case for firms that drift above their optimal leverage ratio. In their international survey, Servaes and Tufano (2006) document that 60% of 334 firms' CFOs restrain themselves from increasing their leverage out of fear of being downgraded. This finding indicates that firms with good ratings do not add more debt even if they are underlevered in order not to lose their high ratings. Following H1 and previous studies, we expect that highly rated (investment-grade), underlevered firms are less likely to adjust leverage and slower to converge at target levels than poorly rated (speculative-grade), overlevered firms. Our second hypothesis follows:

Hypothesis 2: *Firms with a high credit rating (investment-grade) adjust to achieve their optimal debt-equity ratio more slowly than firms with a poor credit rating (speculative-grade).*

Traditionally, in bank-oriented countries the banking industry supplies the majority of credit to firms (Schmukler and Vesperoni, 2000). Ties between companies and the banking sector, such as loan commitments, are stronger than in market-oriented countries (Mishkin, 2005). Because of the close long-term relationship between lenders and the borrowing firms, banks enjoy the advantages of inside monitoring. Improved monitoring decreases information asymmetry, allowing banks to assess the creditworthiness of a borrower using their own internal credit ratings or some other credit scoring system, without needing external credit ratings. Companies that operate in market-based countries do not have such a close relationship with banks and may suffer from a greater degree of information asymmetry. A credit rating agency can bridge this gap by providing credit ratings. Thus, we expect the effects of credit ratings on capital structure decisions to be more significant in a market-based financial system than in a bank-based financial system.

Hypothesis 3: *The effect of a credit rating on a firm's capital structure is more significant in countries with a more market-oriented financial system.*

3.2. Sample and Data Sources

To test our hypotheses in an international context, we start with all available firms listed in Compustat (North American and Global). Our final sample is obtained from a thorough selection process, and each sample firm must meet the following conditions. First, all sample firms must have a long-term issuer credit rating from Standard & Poor's (S&P), and they must be listed on a major stock exchange in their country. Second, following the sampling procedures used in prior research, all firms must have a leverage ratio of less than 1 (Huang and Ritter, 2009) and a market-to-book ratio between 0 and 10 (Leary and Roberts, 2005).

Each firm is represented by at least three consecutive annual observations[10] in the sample and has no missing variables. Third, financial companies (SIC codes 6000-6999) are omitted from the sample, as the nature of financial firms' liabilities are significantly different from those of nonfinancial entities. Similar to de Jong, Kabir, and Nguyen (2008), we retain in our sample only the countries with the highest number of observations rated by S&P so as to obtain at least 50 annual observations from each country. The final sample consists of 19 countries (economies) and 17,102[11] firm-year observations from 1991 to 2010. To our knowledge, this sample is much more comprehensive than is the case in previous international credit rating studies (Huang and Shen, 2015).

Table 1 presents the number of firms and firm-year observations in each country. As expected, the United States has the largest number of firms and firm-year observations, followed by Japan. These two countries are viewed as representative of market-based and bank-based financial systems (e.g., Antoniou et al., 2008). We further classify the sample countries according to the traditional division of market-based and bank-based countries (Demirgüç-Kunt and Maksimovic, 2002) and with respect to the alternative financial architecture approach (Kwok and Tadesse, 2006; Levine, 2002; Tadesse, 2006).

Importantly, four countries (Canada, Mexico, the Netherlands, and Thailand), which were traditionally deemed market based, are qualified as FINARCH(Low). Similarly, two countries (India and Russia) there were deemed bank based and belong to the FINARCH(High) group. These observations are consistent with studies claiming that the traditional breakdown of countries as either market-based and bank-based is too simplistic and does not reflect current economic conditions.

[Table 1 here]

[10] A minimum of three consecutive annual observations are required to conduct the GMM procedure (Arellano and Bond, 1991).

[11] Because of the first-differencing procedure, the number of observations in Tables 3, 5, 7, and 8 is smaller (15,502).

3.3. Explanations of Variables

Like prior research (Antoniou et al., 2008; Leary and Roberts, 2005), we use the ratio of long-term leverage to the market value of total assets (*MLLEV*) as the main dependent variable.[12] Frank and Goyal (2009) identify six core determinants of the market leverage ratio. In our study, we use all six factors: profitability (*EBIT*/*TA*), growth opportunities (*MTB*), relative tangible assets (*TANG*/*TA*), firm size (*SIZE*), median industry leverage (*MEDLEV*), and annual inflation rate (*INFL*). In addition, we control for countries' economic development using gross domestic product (GDP) per capita (*GDPPC*) as a proxy. To diminish the influence of outliers, all firm-specific factors are winsorised at the 1st and 99th percentiles (Faulkender et al., 2012). Appendix A lists all the variables, their definitions, and data sources.

We measure the credit rating variable (*RATING*) by coding all S&P's long-term domestic issuer credit ratings letter grades in terms of 22 ordinal numerical values (from 1 to 22).[13] Table 2 lists the frequency and its associated percentage of the issuer credit ratings in our sample using the S&P rating category along with our corresponding coding system. The results indicate that around 50% of credit ratings are concentrated in the categories of BBB and BB. In addition, we divide the sample based on the classifications of investment grade and non-investment grade. *INVESTDUM* is a dummy variable that equals 1 if firm has an investment-grade credit rating (BBB- or above) and 0 otherwise (BB+ and below). We explore whether the relationship between credit rating level and capital structure differs in the investment grade and speculative grade groups.

[Table 2 here]

[12] We use three additional measures of a firm's leverage ratio as a robustness check: the ratio of total leverage to the market value of total assets (*MLEV*), the ratio of long-term leverage to the book value of total assets (*BLLEV*), and the ratio of total leverage to the book value of total assets (*BLEV*). Using these alternative measures does not materially change our results.

[13] Where AAA = 22, AA+ = 21, AA = 20, AA- = 19, A+ = 18, A = 17, A- = 16, BBB+ = 15, BBB = 14, BBB- = 13, BB+ = 12, BB = 11, BB- = 10, B+ = 9, B = 8, B- = 7, CCC+ = 6, CCC = 5, CCC- = 4, CC = 3, SD = 2, and D = 1. This numerical procedure is similar to the coding system used in, for example, Becker and Milbourn (2011) and Poon, Lee, and Gup (2009).

Because of mixed results in the existing research and the questionable validity of the crude market-based/bank-based division of countries, we use the financial architecture variable as an alternative to classify a country's financial orientation, following the literature (Aggarwal and Goodell, 2011; Beck, Demirgüç-Kunt, and Levine, 2000; Levine, 2002; Tadesse, 2006). The financial architecture variable (*FINARCH*)[14] is the first principal component of three indices representing the size, activity, and efficiency of the stock market relative to the banking system. The larger the value of the *FINARCH* variable, the greater the market-based financial orientation of a country is. We divide the countries into the FINARCH(High) and FINARCH(Low) groups according to the median value of the *FINARCH* variable in the sample. For each year (1991-2010), we use a median of the *FINARCH* variable as a benchmark and compare it to each of the countries' annual *FINARCH* values. Consequently, a country falls into FINARCH(Low) group if more than 50% (11 years or more) of its *FINARCH*'s annual values are below the total sample *FINARCH*'s median for any of the 20 years (1991-2010). Likewise, a country falls into FINARCH(High) group if more than 50% (11 years or more) of its *FINARCH*'s annual values are below the total sample *FINARCH*'s median for any of the 20 years (1991-2010). Based on the rank of annual median values of the financial architecture variable in each economy, ten countries fall into the FINARCH(Low) group and nine into the FINARCH(High) group.

The relevant literature offers four alternative versions of *FINARCH* variable (Beck et al., 2000; Tadesse, 2006). To save space, we report the results only by the first version of financial architecture variable, which is denoted *FINARCH1*. The results are virtually unchanged if we use other versions of the *FINARCH* variable. For a detailed explanation of differences among four versions of *FINARCH*, see Appendix B.

[14] Specifically, the size index measures the size of equity markets compared with that of the banking industry in each of the countries. The activity index is formed by dividing the total value of shares traded relative to GDP by the bank credit ratio. The efficiency index is calculated as the product of the turnover ratio (the ratio of the value of total shares traded to average real market capitalization) and a bank's overhead ratio, which is defined as a bank's overhead costs as a share of its total assets.

3.4. Econometric Specification

We employ dynamic models to test our hypotheses about the relationship between credit rating levels and capital structure decisions. Antoniou et al. (2008) argue that, in order to obtain a valid dynamic model, which takes into account the possibility of the autoregressive process on an error term, a one-period lagged dependent variable is required. We include the lagged terms of leverage and credit ratings in the models. Our benchmark model similar to the one in Antoniou et al. (2008) is specified in Equation 1.

$$Leverage_{it} = \alpha_0 + \alpha_1 Leverage_{i(t\text{-}1)} + \alpha_2 Rating_{i(t\text{-}1)} + \sum_{k=1}^{9} \varphi_k X_{k,it} + C_j + Y_t + \mu_i + \upsilon_t + \varepsilon_{it} \quad (1)$$

where $(Leverage_{it})$ is the leverage ratio for firm *i* in year *t*, (α_0) is a constant term, (α_1), (α_2), and (φ_k) are the coefficients of the parameters to estimate, $(Leverage_{i(t\text{-}1)})$ is the first lag of the dependent variable (to capture the dynamic aspect of capital structure), and $(Rating_{i(t\text{-}1)})$ is the credit rating lagged one year. *X* is a vector of explanatory variables composed of *k*-factors. These factors are as follows: *EBIT/TA*, *MTB*, *SIZE*, *TANG/TA*, *MEDLEV*, *INFL*, *GDPPC*, and *FINARCH1*. C_j is a dummy variable for a given country whereas Y_t is a dummy variable for a given year. (μ_i) represents the time-invariant unobserved firm fixed effects (e.g., reputation or management performance) that influence firms' capital structure. (υ_t) represents the time-specific shocks, which can fluctuate over time and affect all the firms in one or more countries (e.g., demand shocks). The error term (ε_{it}) has a mean equal to zero and constant variance σ^2 and does not suffer from serial correlation. We expect the coefficient (α_2) to be negative, which confirms H1. The speed of leverage adjustment is measured by the coefficient(α_1).

We further explore the impact of credit ratings on adjustment speed and the impact of financial architecture on the relationship between credit ratings and capital structure in Equation 2.

$$Leverage_{it} = \alpha_0 + \alpha_1 Leverage_{i(t\text{-}1)} + \alpha_2 Rating_{i(t\text{-}1)} + \alpha_3 FINARCH_{jt} +$$
$$+\alpha_4 Rating_{i(t\text{-}1)} * Leverage_{i(t\text{-}1)} + \alpha_5 Rating_{i(t\text{-}1)} * FINARCH_{jt} +$$
$$+\sum_{k=1}^{9} \varphi_k X_{k,it} + C_j + Y_t + \mu_i + \upsilon_t + \varepsilon_{it} \quad (2)$$

We include the interaction term between the credit rating and the lagged leverage ratio and the interaction term between the credit rating and the financial architecture in Equation 2. The interaction term between the credit rating and the lagged leverage ratio tests whether the impacts of the credit rating on the adjustment speed of leverage differs for different categories of credit level. H2 predicts that the coefficient α_4 is negative, as poorly rated firms can converge toward their target leverage more rapidly than highly rated firms. However, if the coefficient of the interaction term between the credit rating and the financial architecture is significant, H3 is supported. We expect this coefficient to be negative, as the negative correlation between the credit rating and leverage is reinforced in a country with a more market-based financial orientation.

The problems in the regression models come from two sources of endogeneity: unobservable heterogeneity and simultaneity. The first source is that unobservable heterogeneity causes endogeneity when there are some unobservable determinants (e.g., a company's reputation or management performance) affecting both a dependent variable (here firms' leverage) and its explanatory variable (here a credit rating). The second source is that simultaneity arises when the explanatory variable is affected by the dependent variable or its lags (credit rating and corporate leverage affecting each other). The endogeneity comes from the dynamic nature of credit rating and capital structure decisions. We aim to identify the impacts of credit rating on leverage ratios. However, it can be easily argued that, the leverage ratio is a key determinant of credit rating when credit rating agencies assign ratings to a firm. The past leverage ratio can affect the credit rating level of a firm. This suggests a simultaneity

problem[15], and thus the OLS (or fixed-effect) method would yield biased and possibly spurious and yet statistically significant results. Wintoki, Linck, and Netter (2012) have thoroughly discussed these endogeneity issues arising in the context of governance structure and firm performance.

We put an emphasis on solving the problem of endogeneity between credit ratings and firms' leverage and on identifying causality between credit ratings and firms' leverage/adjustment speed, following the method of dynamic GMM estimator suggested by Wintoki, Linck, and Netter (2012). They argue that "the dynamic nature of the relation between corporate governance and performance actually sets up a powerful methodology for identifying the causal effect of governance on performance" (p. 582) and it is possible to use past variables from firm's history as valid "internal" instrumental variables to address the simultaneity problem without the need for searching for external instruments.[16]

We follow this framework by applying a dynamic GMM approach and using past corporate leverage and rating as a set of "internal" instruments which allows us to mitigate endogeneity problems and identify the causality between credit rating and capital structure decisions. Specifically, our study employs the system GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), which utilizes a system of two equations: one in differences (used in the difference GMM estimator[17]) and one in levels. In addition to the lagged values of variables used as instruments for their first differences (difference GMM), the system GMM estimator uses the lagged first differences as valid (exogenous)[18]

[15] This endogeneity problem is similar to the discussion of impacts of corporate governance on firm performance in Wintoki, Linck, and Netter (2012). They show that the current value of corporate governance variables is a function of past firm performance; the current explanatory variable (governance structure in their paper) is a function of past values of dependent variable (firm performance).

[16] In practice, identifying and justifying a strictly exogenous instrument is very difficult and often not possible.

[17] The difference GMM estimator takes the first difference of all variables in the equation and uses the lagged values of regressors as valid instrumental variables for their first differences. Nevertheless, the difference GMM technique suffers from a number of shortcomings (Arellano and Bover, 1995; Blundell and Bond, 1998). Most importantly, there is a significant sample bias when the autoregressive lagged leverage parameter is highly persistent, i.e., close to 1 (Antoniou et al., 2008).

[18] For a detailed explanation and assumptions under which the system GMM procedure yields a set of valid

instruments for the regressors from the levels equation. Antoniou et al. (2008) argue for the superiority of the two-step system GMM over the one-step system in the case of dynamic modeling. Flannery and Hankins (2013) state that, for unbalanced panels of data, the two-step system GMM "remains the best option for higher levels of endogeneity if the lagged dependent variable is of interest" (p. 13).[19]

4. DISCUSSION OF THE RESULTS

4.1. Summary Statistics

We present two figures to describe the values of the financial architecture variable and the relationships between credit ratings and leverage in the sample countries from 1991 to 2010. Figure 1 reports yearly plots of median *FINARCH1* values for the different samples. There is no surprise with respect to countries typically used as benchmarks for being bank based (France, Japan, Germany) and market based (the United States, the U.K.). In fact, as seen in Figure 1, the United States and Japan persistently have the highest and the lowest *FINARCH1* values, respectively. In general, the annual medians of *FINARCH1* in all four samples demonstrate an increasing trend over time in the market orientation of the financial systems in the countries investigated, in line with the findings of Rajan and Zingales (1995, 2003). In addition, as one would expect, *FINARCH1* values tend to drop during crises and increase during periods of economic prosperity. In particular, two obvious peaks occurred on the eve of the dot-com stock bubble of 2000 and the financial crisis of 2008, followed by substantial and prolonged drops. These phenomena are the most visible in the US sample's plot, followed by a sample of countries labeled as FINARCH(High). In sum, there is a large degree of annual fluctuation within individual countries and samples as well as substantial cross-country differences in financial architecture variables.

[Figure 1 here]

exogenous instruments, see Wintoki et al., (2012), in particular pp. 587-589.

[19] In our research we use a two-step system GMM procedure with orthogonal deviations (we use the application xtabond2 by David Roodman [2009] for STATA).

Figure 2 shows plots of the median leverage ratios (*MLLEV*) by the different credit ratings. The figure shows that the least-leveraged firms are those with the highest credit ratings,[20] which in turn supports H2. Furthermore, it can be observed that when the credit ratings improve, the leverage ratios gradually decrease. The negative relationship between credit ratings and the debt ratio is consistent in the full sample and in the groups classified by financial orientation. These results are consistent with previously established empirical evidence (e.g., Kisgen, 2006; Nishioka and Baba, 2004).[21] The negative relationship provides initial support for H1. Correlation analysis (not tabulated but available from the authors on request) also indicates a negative and statistically significant association between credit ratings and debt ratios in all samples. It is also interesting to find that the firms in the FINARCH(High) group have generally lower debt ratios than firms in the group of FINARCH(Low) in the rating categories from D to AA+. The result is natural, as firms in a market-based financial system can obtain more equity capital from the stock market than the firms in a bank-based financial system, which causes lower debt ratios in the firms in the FINARCH(High) group.

[Figure 2 here]

4.2. Empirical Results

4.2.1. Credit Rating and Capital Structure Decision

We present empirical results estimated from Equation 1 in Table 3. Our main conclusions are drawn from the two-step system GMM, as this successfully controls for endogeneity and other potential econometric problems mentioned in previous sections. The m1, m2, and

[20] Except for the spike leverage around AA ratings in a plot for Japanese firms, which occurs because of a much higher maximum value of leverage in a small number of Japanese firms with ratings ranging from AA- to AA+, compared with ratings ranging from BBB+ to A+ and AAA. One explanation could be linked with a number of firms recognized by S&P as having a very close relationship with their banks (*keiretsu*), and thus this debt was not as dangerous in terms of possible default as otherwise might have been the case. In addition, there has been a long-lasting controversy over credit ratings assigned by the US-based rating agencies to Japanese firms (e.g., Behr and Güttler, 2008; Fairchild and Shin, 2006; Nickell, Perraudin, and Varotto, 2000; Packer and Reynolds, 1997). Our "spike" somehow fits into the existing Japanese "credit ratings controversy," and it remains an open empirical question worth investigating in the future.

[21] Compared to other rated firms.

Hansen tests[22] all indicate that two-step system GMM is correctly specified for all samples.

[Table 3 here]

The results for the credit rating variable shown in Table 3 are robust and provide support for H1. There is a negative and statistically significant relation between credit ratings and firms' debt-equity ratios for the full and FINARCH(High) samples (columns 1 and 2, respectively). In the full sample, the coefficient is -0.0041, which is significant at the 1% level. The coefficient means that a credit rating upgrade of four notches (e.g., from A to AA+) in year *t* will lead to a drop of 4 x 0.41%, i.e., 1.64%, in a company's debt-to-equity ratio one year later, all else being equal. For the FINARCH(High) sample, the coefficient on *RATINGL1* is -0.0042 and significant at the 1% level. This evidence is consistent with the negative and significant correlations described earlier, as well as the results shown in Figure 2. The coefficient in column 3 (FINARCH(Low) sample) is negative (but with a smaller value than those in columns 1 and 2) and lacks statistical significance. The impact of credit ratings on capital structure is not significant in the countries with strong bank-firm ties, which is consistent with H2.

Our findings seem to contradict the argument of the trade-off theory that highly rated firms with a good market reputation should enjoy easier access to cheap debt and increase their leverage. This prediction, however, is belied by the evidence. First, a credit rating is not the only determinant of how expensive it is for a firm to issue debt. Kisgen (2006) argues that managers will not behave in the manner predicted by the trade-off theory when the costs and benefits of credit ratings assigned to a firm outweigh those of increased leverage. His proposition finds confirmation in other empirical studies (e.g., Shivdasani and Zenner, 2005) and surveys (Bancel and Mittoo, 2004; Graham and Harvey, 2001; Servaes and Tufano, 2006).

[22] Untabulated estimates from OLS and fixed effects are used as robustness results. The *LAGLEV* coefficients in Table 3 are in between those from the OLS and fixed-effects regressions, which is where they should be (Roodman, 2009). The tests for the first- (m1) and second- (m2) order correlations test the null hypotheses of no first- or second-order serial correlation in the first-differenced residuals, respectively. The Hansen test of overidentification tests the null hypothesis of the validity of instrumental variables used in the model.

Furthermore, instead of increasing their leverage ratios, firms take advantage of improved credit ratings by restructuring their borrowing in terms of its maturity (Barclay and Smith, 1995; Bougheas et al., 2006; Diamond, 1991a, 1993) and source (e.g., Denis and Mihov, 2003; Diamond, 1991b; Rauh and Sufi, 2010; Stohs and Mauer, 1996) and by issuing new equity. Highly rated firms are less opaque in the eyes of investors (Livingston, Naranjo, and Zhou, 2007). Less opacity leads to lower information asymmetry and adverse selection, thereby decreasing the cost of equity financing (e.g., Frank and Goyal, 2009; Liu and Malatesta, 2005), and increasing the probability of issuing equity (e.g., Asquith and Mullins, 1986; Baker and Wurgler, 2002; Dittmar and Thakor, 2007; Gomes and Phillips, 2012; Marsh, 1982). Rauh and Sufi (2010) find that the better the firm's credit rating is, the larger the share of equity in its capital structure. Therefore, negative and statistically significant coefficients in columns 1 and 2 on *RATINGL1* are consistent with the above-mentioned studies.

Table 3 indicates positive and statistically significant coefficients for *LAGLEV*[23] regardless of a country's financial orientation and economic development. This result is consistent with the findings of González and González (2008) and others. The coefficients are between 0 and 1, which is consistent with leverage converging to desired levels (Antoniou et al., 2008). In Table 3, the coefficients on the lagged leverage ratio indicate slower adjustment for the less-market-based financial orientation sample (column 3).[24] The coefficient in column 3 (0.7015) implies that, on average, rated firms based in countries that are less market-oriented close almost 30% (1 – 0.7015) of the gap between their actual and target leverage within one year. At this speed, it takes about two years[25] to close half the gap

[23] In accordance with the recent studies, the results are based on the ratio of long-term leverage to the market value of total assets (*MLLEV*). All estimates were also conducted using three alternative proxies for leverage ratios (the results are available from the authors on request).

[24] Interestingly, the coefficient on *LAGLEV* in column 1 is below those from the two subsamples. One explanation of this fact could be linked to the results being more driven by the large number of US-based firms in a smaller FINARCH(High) sample than in the full sample. In untabulated regressions for the US-based firms only, the coefficient for *LAGLEV* is approximately 0.66. We have taken precautionary measures to ensure that our results are robust with respect to a potential overrepresentation bias (see Section 5.6).

[25] This calculation is simply ln(0.5)/ln(1 – 0.2985) (e.g., Ö ztekin and Flannery, 2012).

between the current and target levels of debt. Likewise, firms based in countries with highly market-based financial systems (column 2) converge toward their desired leverage by approximately 36.5% a year. This evidence indicates that firms in a more market-based environment are characterized by lower costs of adjustment or larger benefits of convergence toward the optimal leverage ratio (or both) than firms in a more bank-based environment (FINARCH(Low) sample is used as a proxy).[26] Like the results in research such as Flannery and Rangan (2006), our estimates suggest that, in all samples, the target market debt ratios are of pivotal importance for companies.

4.2.2. Credit Rating, Adjustment Speed, and Financial Architecture

Table 4 shows the results estimated from Equation 2, in which we include two interaction variables (*RATINGL1*FINARCH1* and *RATINGL1*LAGLEV*), used to test the validity of H2 and H3. In column 3, we reintroduce both significant interactions simultaneously as robustness measures.

[Table 4 here]

The reported coefficients of the interaction variable *RATINGL1*LAGLEV* are positive and significant at the 1% level. These results suggest that the lower the credit rating is, the faster the adjustment. The estimate on *RATINGL1*LAGLEV* in column 1 (0.0109) means that a company with an AA credit rating closes over 1% less of the gap between its actual and target leverage within one year than its counterpart with an AA- credit rating. In a similar vein, the difference in the speed of adjustment between the firms with the highest and the lowest investment-grade credit rating (AAA versus BBB-) can be as much as 10%. The coefficients on the *RATINGL1*LAGLEV* variable are consistent with Kisgen's (2009) results, which

[26] Antoniou et al. (2008) document similar divergence in the speed of adjustment and argue that, because of the strong ties and close long-term relations between companies and creditors (banks) in bank-based economies, the cost of being away from the optimal capital structure is lower than the cost of adjustment. Therefore, firms can adjust slowly toward their desired level of leverage. Moreover, unlike their peers in market-based countries, firms in bank-based countries depend less on the signaling mechanism of debt to demonstrate their quality to investors in equity or bond markets.

focused on the US market and showed that downgraded firms adjust significantly more rapidly toward their target levels of leverage. However, our results focus on credit rating levels instead of rating changes, and they confirm H2.

The finding that poorly rated firms have more rapid adjustment than highly rated firms is in line with the existing literature. First, overlevered or poorly rated firms face increasingly higher costs[27] while deviating above and farther away from their target levels of leverage than highly rated or underlevered firms deviating below their target levels (Faulkender et al., 2012; Hovakimian, 2004). On the one hand, poor credit ratings magnify the costs of being distant from the target leverage. On the other hand, the benefits of high credit ratings diminish or even outweigh (Kisgen, 2006) these costs. Second, Servaes and Tufano (2006) find that CFOs (60% of those surveyed), for fear of losing a credit rating, do not add more debt to firms' capital structure. This suggests that, despite being underlevered, firms with good ratings do not increase their leverage.[28] Third, Korajczyk and Levy (2003) document that financially unconstrained firms with good ratings are more likely to deviate from their target leverage ratio in an attempt to time the market by issuing/repurchasing securities when macroeconomic conditions are most favorable. Moreover, de Jong et al. (2012) argue that instead of adjusting their capital structure and issuing cheaper debt, firms with an investment-grade credit rating remain underlevered so as to preserve the capacity to raise debt in the future, which leads to a slow adjustment speed.

Table 4 also tests H3 with respect to the relationship between the credit rating and the capital structure in countries with different financial orientations. The coefficients for *RATINGL1*FINARCH1* provide strong support for H3—that is, they have negative signs (-0.0010) and are statistically significant at the 1% level in both columns 2 and 3. These results confirm a higher dependence of the capital structure on credit ratings when companies

[27] E.g., increasing bankruptcy costs, which lead to higher costs of both debt and equity financing.
[28] Figure 2 offers initial support for this rationale.

operate in an environment with more developed stock markets (those with higher *FINARCH1* scores). The finding is also consistent with the results in Table 3, which indicate that the relationship between credit ratings and the capital structure is more significant in the FINARCH(High) group sample. Conventional thinking holds that corporate leverage is higher in bank-based countries and that the creditworthiness of a firm is assessed by banks without much need for an externally provided credit rating. We further show that the financial orientation of a country can also influence the magnitude of a credit rating's impact on debt-equity ratios. This argument has not been explored in the existing literature.

5. ROBUSTNESS TESTS

5.1. Speeds of Adjustment across Different Rating Classes

In Table 5, motivated by Kisgen (2006, 2009), and their argument that credit ratings carry additional costs and benefits, which can outweigh the costs and benefits of adjusting toward target leverage levels, we divide the previously estimated samples into two subsamples (firms with investment-grade credit ratings versus firms with speculative-grade credit ratings). The results are consistent with those in Table 4. An initial inspection of results suggests that all three samples[29] show a stark disparity in the speed of adjustment between investment-rated and speculative-rated firms. For example, in the FINARCH(High) sample, companies with speculative-grade credit ratings (column 3) close about 37% of the gap between their actual and target debt ratios within one year, implying that it takes 18 months[30] to close half the gap between firms' desired and current leverage ratios. Likewise, investment-grade firms reduce the gap between their actual and target debt ratio within one year by 28% and need 25 months to close half the gap. In other words, firms with below-investment-grade credit ratings close approximately 9% more of the gap annually, and they need a seven-month-shorter period to close half the distance between the

[29] The three samples are All countries (columns 1-2), FINARCH(High) (columns 3-4), and FINARCH(Low) (columns 5-6).
[30] This calculation is simply ln(0.5)/ln(1 – 0.3706).

above-mentioned debt ratios. However, after conducting pairwise statistical tests of difference[31] between the *LAGLEV* coefficients for highly rated versus poorly rated firms in each of the three samples, it becomes clear that the above-mentioned difference in the speed of adjustment is statistically significant at the 1% and 5% levels for firms in the FINARCH(High) and All countries samples, respectively. This coincides with H2 and the expected greater significance of credit ratings in more market-oriented financial macro-environments. In sum, the estimates from Table 5 offer additional support for H2 and H3.

[Table 5 here]

5.2. Tests of H2 and H3 using the *INVESTDUM* Variable and Its Interaction Terms

Previous credit rating literature has shown significant differences between the behaviors at firms with investment-grade and speculative–grade credit ratings assigned. Instead of using the interaction terms with the *RATING* variable in Equation 2, we create interaction terms with the dummy variable *INVESTDUM*. If the claims from H2 and H3 are correct, the coefficients on the interaction variables should be statistically significant and carry the expected signs. Table 6 shows the results of the robustness tests that confirm the results of H2 and H3. The coefficients on *INVESTDUM*LAGLEV* and *INVESTDUM*FINARCH1* in Table 6 are highly statistically significant at the 1% level with the expected signs. Therefore, Table 6 offers robust support for H2 and H3.

[Table 6 here]

5.3. Rating Agencies' Increased Conservatism over Time

In their empirical work, Baghai et al. (2014) find evidence that "Rating agencies have become more conservative in assigning corporate credit ratings over the period 1985 to 2009" (p. 1961). They argue that this increased conservatism makes firms less leveraged, less likely

[31] The authors thank the anonymous referee from the *European Journal of Finance* for suggesting this approach. The calculations are not presented in the paper, but are available from the authors on request.

to seek bond credit ratings and keep more cash on their balance sheets. In order to capture the above-mentioned phenomena, we replicate their method and create two proxies for rating conservatism: the variables *RAT_DIFF_IND* and *RAT_DIFF_FIRM*.[32] In addition to first lags of these two measures of rating conservatism (added into our model one at a time), we incorporate the variable *CASH/ASSETS*[33] into our base model (equation 1).

The results are presented in columns 1 and 2 of Table 7 which offer further support for our previous findings in terms of their robustness. In addition, in line with Baghai et al. (2014), we also find evidence for increased conservatism in S&P's issuer credit ratings in an international sample. The coefficients of both *RAT_DIFF_INDL1* and *RAT_DIFF_FIRML1* are positive[34] and statistically significant at the 5% level. The coefficient on the variable *CASH/ASSETS* has a negative sign and is highly statistically significant, confirming results in the previous literature (e.g., Devos, Dhillon, Jagannathan, and Krishnamurthy, 2012), and supports the robustness of our main results/tests.

[Table 7 here]

5.4. Credit Rating Changes

In his seminal paper, Kisgen (2009) documents that firms operating in the United States adjust their capital structure in reaction to negative changes in their credit rating by reducing their leverage after being downgraded. In addition, he finds that firms' reaction to upgrades is much weaker, in both economic and statistical senses. Huang and Shen (2015), in their international study, support Kisgen's (2009) findings. In order to test for the robustness of our main results, we include one-period lags of two credit rating change dummy variables

[32] The equation for rating conservatism they use is as follows: $RAT\_DIFF_{i,t} = Actual\ Rating_{i,t} - Predicted\ Rating_{i,t}$. For more detailed explanations of these two variables, see Appendix A or Baghai et al. (2014).

[33] In an unreported series of regressions, we try nine alternative cash ratios. The results remain robust and unchanged.

[34] Both coefficients for rating conservatism in our study have opposite signs (i.e., positive) from those in Baghai et al. (2014). This is caused by our method of assigning numerical values to S&P's credit ratings. Baghai et al. (2014) use 1 = AAA to 21 = C (p. 1965) while we use 22 = AAA to 1 = D. Therefore, in Baghai et al. (2014) negative coefficients on *RAT_DIFF_INDL1* and *RAT_DIFF_FIRML1* variable imply conservatism, whereas in our results, positive coefficients imply conservatism.

(*UPGRADEL1* and *DOWNGRADEL1*) in our base model (equation 1). The results that are presented in Table 7 (column 3) are consistent with previous studies (Huang and Shen, 2015; Kisgen, 2009). Furthermore, they do not alter our main findings, that is, the coefficient on *RATINGL1* remains negative and statistically significant.

5.5. Near the Borders Credit Ratings

Following Kisgen (2006), we test whether firms with plus, minus, and plus or minus ratings assigned decrease their leverage. We do so to verify whether our variable *RATINGL1* accurately captures the effect of credit rating levels on firms' capital structure. If that is the case, three dummy variables[35] added to our base model (equation 1) should not alter our results (in particular: the sign, magnitude, and significance of the *RATINGL1* variable). Again, the main results are virtually unchanged,[36] which further support our main findings and suggests that the variable *RATINGL1* captures the effect of credit ratings on firms leveraging policies and that credit ratings levels are important irrespective of plus or minus refinement. In other words, firms are generally concerned with their credit ratings per se (e.g., whether the credit rating is AA-, AA, or AA+).

5.6. Sensitivity Tests[37]

We conduct a battery of sensitivity tests to further check the robustness of our results. Instead of using *FINARCH1* as a measure of the financial orientation of a country, we use three alternative measures of financial architecture (see Appendix B). We find that the estimated results are virtually the same. The United States (Japan) has been traditionally used as a benchmark for a market-based (bank-based) economy. In addition, the United States has the highest (Japan the lowest) *FINARCH1* values documented in our paper. For these reasons,

[35] As in Kisgen (2006), we create three dummy variables such that "CRPlus = dummy variable (equal to 1) for firms that have a plus credit rating at the beginning of the period, as described above. CRMinus = dummy variable for firms that have a minus credit rating at the beginning of the period, as described above. CRPOM = CRPlus + CRMinus = dummy variable for firms that have a minus or plus credit rating at the beginning of the period, as described above" (Kisgen, 2006, p. 1048).

[36] For brevity, those results are not tabulated, but are available from the authors on request.

[37] Detailed results are available from the authors on request.

we rerun our analyses separately for the United States and Japan. The results once again support all three hypotheses. Moreover, we rerun our analyses after removing US and Japanese firms from the sample (to eliminate the overrepresentation bias). Our results still hold, although statistical significances decline. We also add interaction terms *RATINGL1*US* and *RATINGL1*JAPAN* to the model and find support for all three hypotheses.

6. CONCLUSIONS

Until recently, the impact of credit ratings on capital structure across countries has been relatively neglected. Our paper extends prior research by investigating the role of credit ratings on firms' capital structures and their speed of adjustment toward target debt levels in 19 countries with different financial orientations. Unlike the previous literature, we successfully tackled a serious problem of endogeneity occurring between the credit ratings and firms' leverage by employing the two-step system GMM econometric procedure.

We find that the impact of credit ratings on capital structure is negative and more significant in countries with more market-based financial systems, measured by the financial architecture variable. The negative relationship between credit ratings and leverage ratios can be associated with material costs and benefits of credit ratings for firms (in particular with respect to the highest ratings) and asymmetric information. Companies with a better credit rating may become more conservative about using debt financing and enjoy easier access to equity financing than those with a poor credit rating. Thus, they issue more equity and less debt, which leads to a lower leverage ratio. We also find that the more developed the equity market is, the more significant this effect is. Cross-country analysis provides further support for the negative relation as highly rated firms in a market-based financial system are more likely to obtain equity financing from the market.

Our results also indicate that in countries that have a more market-oriented financial system, firms with a poorer credit rating exhibit significantly (both economically and

statistically) more rapid adjustment toward their target debt level than firms with a higher credit rating. This evidence supports our hypothesis that credit ratings have greater importance for firms in economies with more a market-based financial architecture. This finding is consistent with Huang and Shen (2015) and Kisgen (2006) that downgraded firms adjust their capital structure more rapidly than upgraded firms, especially in countries with strong governance. However, our study explores the adjustment speed of firms with different rating levels in addition to rating changes.

This study is not free from limitations with respect to the measurement of firms' leverage and its components[38]. First, we do not distinguish between public and private debts. The firms' choices with respect to private versus public debts are determined by other firm-specific factors (including credit ratings as mentioned in Denis and Mihov (2003)) and countries' institutional factors. Therefore, it would be worthwhile to further investigate how firms with different credit ratings that are based in countries with different financial orientations decide on leverage composition between private and public debts. Second, following the traditional method for calculating market leverage ratios (e.g., Antoniou et al., 2008; Leary and Roberts, 2005), we exclude off-balance sheet debts such as leases. This approach understates firms' true leverage ratios[39] (e.g., Kraft, 2015) and the estimation of the adjustment speed of leverage ratio may be biased given such limitation. Hence, including off-balance sheet debts may shed a different light on the relationship between credit ratings and firms' capital structure in the international context. We believe that further studies could be conducted in order to examine this important avenue.

[38] The authors thank the anonymous referee from the *European Journal of Finance* for pointing out the two caveats.

[39] That being the case regardless of whether on-balance sheet debts and off-balance sheet leases work as substitutes (e.g., Myers, Dill and Bautista, 1976) or complements (e.g., Ang and Peterson, 1984; Lewis and Schallheim, 1992).

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Table 1

Sample Countries Grouped by Financial Systems' Orientation and Economic Development

This table presents all the countries used in the study with regard to the orientation of their financial system. Based on a comparison of annual median values of the *FINARCH1* variable in each economy with the total sample *FINARCH1's* annual medians, 10 countries fall into the FINARCH(Low) group and 9 into the FINARCH(High) group. For each year (1991-2010) we use a median of the *FINARCH1* variable as a benchmark and compare it to each of the countries' annual *FINARCH1* values. Consequently, a country falls into FINARCH(Low) group if more than 50% (11 years or more) of its *FINARCH1's* annual values are below the total sample *FINARCH1's* median for any of the 20 years (1991-2010). Likewise, a country falls into FINARCH(High) group if more than 50% (11 years or more) of its *FINARCH1's* annual values are below the total sample *FINARCH1's* median for any of the 20 years (1991-2010). Eight countries are traditionally classified as bank based, and 11 countries as market based (Demirgüç-Kunt and Maksimovic, 2002; Popov, 1999).

A Country Financial System's Orientation					
FINARCH(High)	**Number of firms from each country**	**Number of observations from each country**	**FINARCH(Low)**	**Number of firms from each country**	**Number of observations from each country**
Australia (**Market**-Based)	27	323	Canada (**Market**-Based)	57	598
India (**Bank**-Based)	8	53	France (**Bank**-Based)	40	394
Hong Kong (**Market**-Based)	10	86	Germany (**Bank**-Based)	35	327
Korea (**Market**-Based)	19	144	Indonesia (**Bank**-Based)	13	86
Russia (**Bank**-Based)	18	111	Italy (**Bank**-Based)	16	133
Sweden (**Market**-Based)	16	186	Japan (**Bank**-Based)	240	1,823
Switzerland (**Market**-Based)	13	129	Mexico (**Market**-Based)	16	170
the U.K. (**Market**-Based)	53	505	Netherlands (**Market**-Based)	13	133
the U.S. (**Market**-Based)	904	11,729	Spain (**Bank**-Based)	10	117
			Thailand (**Market**-Based)	7	55
Total	**1,135**	**14,058**		**380**	**3,044**

Table 2
Ordinal Coding System along with S&P's Rating Scale

This table summarizes firms' issuer letter credit ratings used by S&P (column 1) and the corresponding numerical equivalents used in our study (column 2). The highest possible rating assigned (AAA) is reserved for the firms with "Extremely strong capacity to meet financial commitments" and the lowest possible rating (D) means "Payment default on financial commitments" (S&P, 2016). Columns 3 and 4 list frequencies and percentages of the overall sample (from 1991 to 2010) for each credit rating category.

Standard & Poor's Long-Term Issuer Credit Rating			
RATING	**Ordinal Value Assigned**	**Frequency in the Sample**	**% Share in the Sample**
AAA	22	244	1.43%
AA+	21	104	0.61%
AA	20	432	2.53%
AA-	19	711	4.16%
A+	18	907	5.30%
A	17	1,582	9.25%
A-	16	1,502	8.78%
BBB+	15	1,780	10.41%
BBB	14	2,113	12.36%
BBB-	13	1,615	9.44%
BB+	12	1,059	6.19%
BB	11	1,302	7.61%
BB-	10	1,468	8.58%
B+	9	1,111	6.50%
B	8	632	3.70%
B-	7	318	1.86%
CCC+	6	91	0.53%
CCC	5	39	0.23%
CCC-	4	12	0.07%
CC	3	26	0.15%
SD	2	8	0.05%
D	1	46	0.27%
Total		**17,102**	**100%**

Source: S&P (2016).

Table 3
Credit Rating Effect on Firms' Capital Structures

The dependent variable is the long-term leverage to the market value of total assets ratio (*MLLEV*). m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *T*-statistics based on asymptotic standard errors that are robust to small sample bias, heteroskedasticity, and clustered by the firms are in parentheses. See Table 1 for a list of countries grouped by their financial orientation. See Appendix A for a list of all variables and their definitions. *, **, and *** coefficient significance at the 10%, 5%, and 1% levels, respectively. In the models, we include the year and country dummies, the firm-, industry-, and macroeconomic determinants of leverage (described in Appendix A) other than those directly involved in our hypotheses. For the sake of brevity, they are not shown in the table.

Independent Variable	**(1)** **All Countries**	**(2)** **FINARCH (High)**	**(3)** **FINARCH (Low)**
LAGLEV	0.6331***	0.6342***	0.7015***
	(32.33)	(29.81)	(13.61)
RATINGL1	-0.0041***	-0.0042***	-0.0013
	(-5.10)	(-4.83)	(-0.55)
Industry dummies	Y	Y	Y
Year dummies	Y	Y	Y
Country dummies	Y	Y	Y
Firms	1,515	1,068	447
Observations	15,502	12,123	3,379
Period of Est.	1991-2010	1991-2010	1991-2010
m1 (*Z*-statistic)	-11.57***	-10.49***	-7.67***
m2 (*Z*-statistic)	0.52	0.48	0.02
Hansen test (*p*-value)	0.09	1.00	0.16

Table 4
Tests of Hypotheses 2 and 3 Using Interaction Terms

The dependent variable is the long-term leverage to the market value of total assets ratio (*MLLEV*). m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *T*-statistics based on asymptotic standard errors that are robust to small sample bias, heteroskedasticity, and clustered by the firms are in the parentheses. See Table 1 for a list of countries grouped by their financial orientation. See Appendix A for a list of all variables and their definitions. *, **, and *** coefficient significance at the 10%, 5%, and 1% levels, respectively. In the models, we include the year and country dummies, the firm-, industry-, and macroeconomic determinants of leverage (described in Appendix A) other than those directly involved in our hypotheses. For the sake of brevity, they are not shown in the table.

Independent Variable	**(1)** **Hypothesis 2**	**(2)** **Hypothesis 3**	**(3)** **All**
LAGLEV	0.5142***	0.6335***	0.5337***
	(10.59)	(32.61)	(11.34)
RATINGL1	-0.0063**	-0.0045***	-0.0063***
	(-6.10)	(-6.70)	(-6.96)
FINARCH1	0.0012	0.0132***	0.0140***
	(0.97)	(3.61)	(3.77)
RATINGL1 LAGLEV*	0.0109***		0.0094***
	(3.02)		(2.70)
*RATINGL1*FINARCH1*		-0.0010***	-0.0010***
		(-3.98)	(-4.06)
Industry dummies	Y	Y	Y
Year dummies	Y	Y	Y
Country dummies	Y	Y	Y
Firms	1,515	1,515	1,515
Observations	15,502	15,502	15,502
Period of Est.	1991-2010	1991-2010	1991-2010
m1 (*Z*-statistic)	-12.01***	-11.57***	-11.98***
m2 (*Z*-statistic)	0.53	0.50	0.51
Hansen test (*p*-value)	0.33	0.34	0.16

Table 5
Speed of Adjustment for Firms with Investment and Speculative Credit Ratings

The dependent variable is the long-term leverage to the market value of total assets ratio (*MLLEV*). m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *T*-statistics based on asymptotic standard errors that are robust to small sample bias, heteroskedasticity, and clustered by the firms are in the parentheses. See Table 1 for a list of countries grouped by their financial orientation. See Appendix A for a list of all variables and their definitions. *, **, and *** coefficient significance at the 10%, 5%, and 1% levels, respectively. In the models, we include the year and country dummies, the firm-, industry-, and macroeconomic determinants of leverage (described in Appendix A) other than those directly involved in our hypotheses. For the sake of brevity, they are not shown in the table. The investment-grade (speculative-grade) column reports estimated coefficients for all firms with S&P's issuer credit ratings BBB- or above (BB+ or below).

Independent Variable	**(1)** **All Countries**	**(2)** **All Countries**	**(3)** **FINARCH (High)**	**(4)** **FINARCH (High)**	**(5)** **FINARCH (Low)**	**(6)** **FINARCH (Low)**
	speculative-grade	**investment-grade**	**speculative-grade**	**investment-grade**	**speculative-grade**	**investment-grade**
LAGLEV	0.6074***	0.6851***	0.6294***	0.7167***	0.6366***	0.7065***
	(21.22)	(41.27)	(20.55)	(36.37)	(7.66)	(15.34)
FINARCH1	0.0089**	-0.0016	0.0096	-0.0025	-0.0054	-0.0055
	(2.39)	(-1.43)	(1.57)	(-1.34)	(-0.24)	(-0.67)
Industry dummies	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y
Country dummies	Y	Y	Y	Y	Y	Y
Firms	818	1,017	646	647	167	343
Observations	5,449	10,053	4,546	7,282	881	2,498
Period of Est.	1991-2010	1991-2010	1991-2010	1991-2010	1991-2010	1991-2010
m1 (*Z*-statistic)	-7.74***	-14.73***	-7.25***	-12.95***	-5.51***	-7.49***
m2 (*Z*-statistic)	1.13	-1.02	0.87	0.07	0.31	-1.61
Hansen test (*p*-value)	0.58	0.11	0.67	0.16	0.33	0.63

Table 6
Robustness Tests of Hypotheses 2 and 3 Using the INVESTDUM Variable and Its Interactions

The dependent variable is the long-term leverage to the market value of total assets ratio (*MLLEV*). *INVESTDUM* is a dummy variable equal to 1 if firm has an investment-grade credit rating (BBB- or above) and 0 otherwise (BB+ and below). m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *T*-statistics based on asymptotic standard errors that are robust to small sample bias, heteroskedasticity, and clustered by the firms are in the parentheses. See Table 1 for a list of countries grouped by their financial orientation. See Appendix A for a list of all variables and their definitions. *, **, and *** coefficient significance at the 10%, 5%, and 1% levels, respectively. In the models, we include the year and country dummies, the firm-, industry-, and macroeconomic determinants of leverage (described in Appendix A) other than those directly involved in our hypotheses. For the sake of brevity, they are not shown in the table.

Independent Variable	**(1) Hypothesis 2**	**(2) Hypothesis 3**	**(3) All**
LAGLEV	0.6435***	0.6208***	0.6215***
	(34.89)	(27.17)	(27.00)
INVESTDUM	-0.0269***	-0.0370***	-0.0419***
	(-6.78)	(-4.89)	(-5.84)
FINARCH1	0.0032*	0.0009	0.0040**
	(1.87)	(0.73)	(2.32)
*INVESTDUM*FINARCH1*	-0.0052***		-0.0058***
	(-3.25)		(-3.50)
*INVESTDUM*LAGLEV*		0.0567**	0.0710***
		(2.12)	(2.63)
Industry dummies	Y	Y	Y
Year dummies	Y	Y	Y
Country dummies	Y	Y	Y
Firms	1,515	1,515	1,515
Observations	15,502	15,502	15,502
Period of Est.	1991-2010	1991-2010	1991-2010
m1 (*Z*-statistic)	-11.67***	-11.81***	-11.88***
m2 (*Z*-statistic)	0.61	0.54	0.53
Hansen test (*p*-value)	0.50	0.37	0.23

Table 7
Robustness Tests: Rating Agencies' Increased Conservatism and Credit Rating Changes

The dependent variable is the long-term leverage to the market value of total assets ratio (*MLLEV*). m1 and m2 are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *T*-statistics based on asymptotic standard errors that are robust to small sample bias, heteroskedasticity, and clustered by the firms are in parentheses. See Appendix A for a list of all variables and their definitions. *, **, and *** coefficient significance at the 10%, 5%, and 1% levels, respectively. In the models, we include the year and country dummies, the firm-, industry-, and macroeconomic determinants of leverage (described in Appendix A) other than those directly involved in our hypotheses. For the sake of brevity, they are not shown in the table.

Independent Variable	**(1)** **All Countries**	**(2)** **All Countries**	**(3)** **All Countries**
LAGLEV	0.6788***	0.6669***	0.6761***
	(30.12)	(23.26)	(34.08)
RATINGL1	-0.0074***	-0.0140***	-0.0020***
	(-4.59)	(-3.01)	(-2.21)**
UPGRADEL1			0.0065***
			(1.05)
DOWNGRADEL1			-0.01755***
			(-3.09)
CASH/ASSETS	-0.1669***	-0.1771***	
	(-6.05)	(-5.74)	
RAT_DIFF_INDL1	0.0017**		
	(2.48)		
RAT_DIFF_FIRML1		0.0096**	
		(2.12)	
Industry dummies	Y	Y	Y
Year dummies	Y	Y	Y
Country dummies	Y	Y	Y
Firms	1,195	1,195	1,515
Observations	10,555	10,555	13,903
Period of Est.	1991-2010	1991-2010	1991-2010
m1 (*Z*-statistic)	-9.78***	-9.74***	-11.28***
m2 (*Z*-statistic)	0.39	0.30	0.60
Hansen test (*p*-value)	0.24	0.30	0.59

Figure 1
Yearly Plot of Median FINARCH1 Values

This figure reports yearly plots of median *FINARCH1* values for four different samples. Based on the rank of annual median values of *FINARCH1* variable in each economy, 8 countries (Australia, Hong Kong, India, South Korea, Russia, Sweden, Switzerland, and the U.K.) fall into the FINARCH(High) group, whereas 9 countries (Canada, France, Germany, Indonesia, Italy, Mexico, the Netherlands, Spain, Thailand) fall into the FINARCH(Low) group. We present separate plots for the United States and Japan. The higher the value of the index, the greater is the market-based financial orientation of a country.

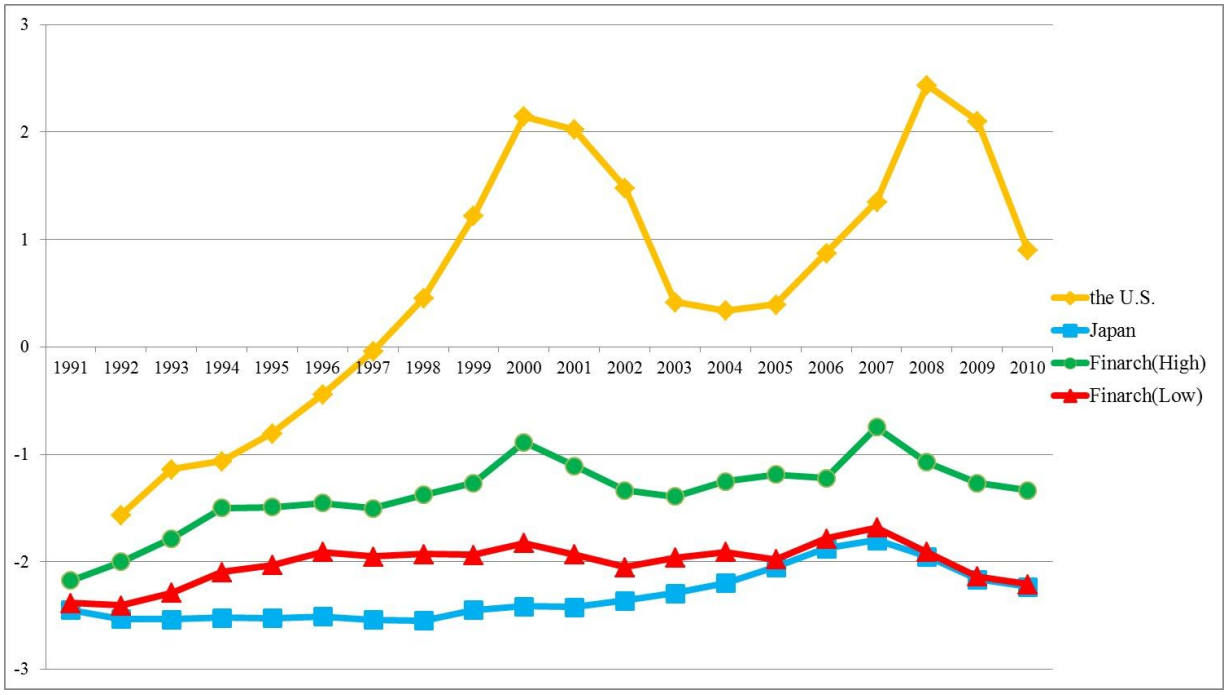
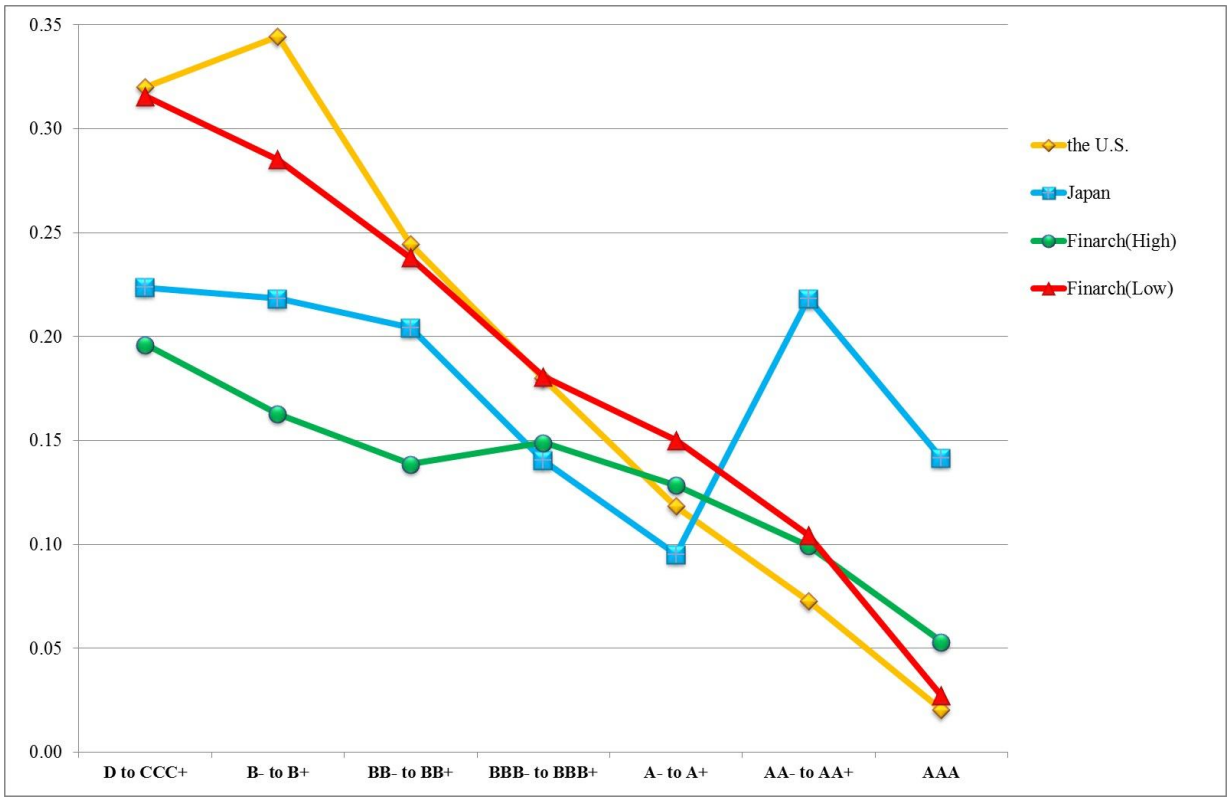


Figure 2
Long-Term Leverage to the Market Value of Total Assets Ratio (MLLEV) by Different Credit Ratings

This figure shows plots of the dependent variable's medians (*MLLEV*) by different credit rating levels. The median values of *MLLEV* and their plots indicate that the least leveraged firms are those with the highest credit ratings. Eight countries (Australia, Hong Kong, India, South Korea, Russia, Sweden, Switzerland, and the U.K.) fall into the FINARCH(High) group, whereas 9 countries (Canada, France, Germany, Indonesia, Italy, Mexico, the Netherlands, Spain, Thailand) fall into the FINARCH(Low) group. We present separate plots for the United States and Japan.



Appendix A
Firm, Industry, and Country Characteristics

This appendix lists all dependent and independent variables used in the regression analysis. The Name column gives the exact names of dependent (*MLLEV*, *MLEV*, *BLLEV*, and *BLEV*) and independent variables used in the econometric modeling process, corresponding to the mentioned characteristics. The Definition column describes calculations performed to obtain the variables. The Data Source column provides all the databases from which we obtained the variables.

Name	Variable	Definition	Data Source
Dependent variable			
MLLEV	Long-term leverage to the market value of total assets ratio	Long-term debt/(Book Value of Total Assets-Book Value of Equity + Market Value of Equity)	Compustat Global and Compustat North America
MLEV	Total leverage to the market value of total assets ratio	(Long-term debt + Short-term debt)/(Book Value of Total Assets-Book Value of Equity + Market Value of Equity)	Compustat Global and Compustat North America
BLLEV	Long-term leverage to the book value of total assets ratio	Long-term debt/Book Value of Total assets	Compustat Global and Compustat North America
BLEV	Total leverage to the book value of total assets ratio	(Long-term debt + Short-term debt)/Book Value of Total assets	Compustat Global and Compustat North America
Firm characteristics			
EBIT/TA	Profitability ratio	Earnings Before Interest and Taxes/Book Value of Total assets	Compustat Global and Compustat North America
MTB	Market-to-book ratio (growth opportunities)	(Long-term debt + Short-term Debt + Preferred capital + Market Value of Equity)/Book Value of Total assets	Compustat Global and Compustat North America
SIZE	Firm size	Natural logarithm of total annual assets measured in the U.S. dollars	Compustat Global and Compustat North America, Datastream
TANG/TA	Relative tangible assets	[Property, Plant and Equipment Total (Net)]/Book Value of Total Assets	Compustat Global and Compustat North America
CASH/ASSETS	Firm cash holdings	Cash and Short-Term Investments/Book Value of Total assets	Compustat Global and Compustat North America
RATINGL1	Standard & Poor's domestic long-term issuers credit ratings lagged one year	Transformed by assigning ordinal values: from 1 for the lowest rating (D), to 22 for the highest rating (AAA)	Compustat North America, OSIRIS, S&P Global Credit Portal
UPGRADEL1	Credit rating upgrade dummy lagged one year	A dummy variable equals to one if the firm's credit rating is upgraded and zero otherwise.	Compustat North America, OSIRIS, S&P Global Ratings
DOWNGRADEL1	Credit rating downgrade dummy lagged one year	A dummy variable equals to one if the firm's credit rating is downgraded and zero otherwise.	Compustat North America, OSIRIS, S&P Global Credit Portal

Appendix A (continued)

Name	Variable	Definition	Data Source
Firm characteristics			
INVESTDUM	Investment-grade credit rating dummy	A dummy variable equal to one if a firm has an investment-grade credit rating (BBB- or above) and zero otherwise (BB+ and below).	Compustat North America, OSIRIS, S&P Global Ratings
RAT_DIFF_INDL1	Ratings conservatism first proxy	Created by replicating the procedure by Baghai et al. (2014) to obtain the difference between the actual Standard and Poor's rating and the rating predicted based on industry fixed effects, i.e., RAT_ DIFF_IND$_{i,t}$ = Actual Rating$_{i,t}$ − Predicted Rating$_{i,t}$	Compustat North America, OSIRIS, S&P Global Ratings, Baghai et al. (2014)
RAT_DIFF_FIRML1	Ratings conservatism second proxy	Created by replicating the procedure by Baghai et al. (2014) to obtain the difference between the actual Standard and Poor's rating and the rating predicted based on firm fixed effects, i.e., RAT_ DIFF_FIRM$_{i,t}$ = Actual Rating$_{i,t}$ − Predicted Rating$_{i,t}$	Compustat North America, OSIRIS, S&P Global Ratings, Baghai et al. (2014)
Industry characteristic			
MEDLEV	Median industry leverage	The median value of *MLEV* variable by SIC code and by year.	Compustat, EHSO (2012), Frank and Goyal (2009)
Macroeconomic variables			
INFL	Annual inflation rate	Inflation measured by the consumer price index reflects the annual percentage change.	World Bank (2011)
FINARCH1	Financial architecture (measured annually)	The first principal component of three indices measuring the country's financial system orientation based on the relative size, activity, and efficiency of stock markets vis-à-vis the banking sector. The higher is the value of FINARCH, the more market-oriented is the financial system of a country.	World Bank (2013)
		• The relative size index: [(market capitalization of domestic stocks / GDP) / deposit money bank assets / GDP)]	World Bank (2013)
		• The relative efficiency index: [(total value of shares traded /average real market capitalization) * (banking overhead costs / banking assets)]	World Bank (2013)
		• The relative activity index: [(total value of shares traded / GDP) / (claims of the banking sector against the private real sector / GDP)]	World Bank (2013)
GDPPC	GDP per capita (current US$)	GDP per capita is gross domestic product divided by midyear population. Data are in current US$.	IMF (2012)

Appendix B
Four Measures of FINARCH Variable

This Appendix lists the definitions of four alternative measures of the *FINARCH* variable used in the paper. In line with Beck et al. (2000) and Tadesse (2006), four versions of the *FINARCH* variable differ only in their efficiency index.

Name	**Definition**
FINARCH	The first principal component of three indices measuring the country's financial system orientation based on the relative size, activity, and efficiency of stock markets vis-à-vis the banking sector. The higher is the value of FINARCH, the more market-oriented is the financial system of a country.
The relative size index	[(market capitalization of domestic stocks/GDP)/claims of the banking sector against the private real sector/GDP)]
The relative activity index	[(total value of shares traded/GDP)/(claims of the banking sector against the private real sector/GDP)]
The relative efficiency index 1 (FINARCH1)	[(total value of shares traded/average real market capitalization) * (banking overhead costs/banking assets)]
The relative efficiency index 2 (FINARCH2)	[(total value of shares traded/GDP) * (banking overhead costs/banking assets)]
The relative efficiency index 3 (FINARCH3)	[(total value of shares traded/GDP) * (banking net interest revenue/banking interest-bearing assets)]
The relative efficiency index 4 (FINARCH4)	[(total value of shares traded/average real market capitalization) * (banking net interest revenue/banking interest-bearing assets)]

Sources: Beck et al. (2000), Tadesse (2006).